FFF or 666 by Dr. SC Jones, DD; 8-2009

In the Greek alphabet the letter F also represents the number 6. The 'scientific world's' common usage name for the method of Field-Flow Fractionation is **FFF,** the separation and sizing of macromolecules and particles, and is used in biotechnology in the micromanipulation of biological cells.

Could John have possibly read FFF as 666 in the Biblical prophecy of Revelations 13:16-18?

"And he causeth all, both small and great, rich and poor, free and bond, to receive a mark in their hand, or in their foreheads: And that no man might buy or sell, save he that had the mark, or the name of the beast, or the number of his name. Here is wisdom. Let him that hath understanding count the number of the beast: for it is the number of a man; and his number is Six hundred threescore and six. [666]." [Torment of the mark -- Revelations 14:9-11]

Ultrasonic sound waves applied by FFF to MMEA *[Multiple Micro Electrode Array]* chips implanted into the median nerve or brain will break-up physiologically generated and responsive neural firing, over-riding it with BMI* computer simulated patterns that replace man's independent physiological process control. *[*Brain Machine Interface: Computer Hardware/ Software connects to brain and nervous system, receiving and transmitting electrical signals.]*

Acoustic Radiation or Ultrasonic Waves programmed to break-up man's natural neural firing are transmitted in FFF form via satellite to an MMEA chip implant. These BMI computer generated electrical signals simulate, over-ride and replace natural neural electrical patterns to control mental, emotional, and anatomical processes.

The BMI hardware, software program also transmits via RF *[Radio Frequency]* from the transponder interface built into the MMEA. The 100 individual electrodes implanted in the median nerve each transmit through a 25-channel neural signal amplifier, amplified by 5000 and filtering corner frequencies of 250Hz and 7.5Hz. The amplified and filtered electrode signals are then delivered to the neural signal processor where they are digitized at 30,000 samples/second/ electrode and scanned online for neural spike events.

U.S. Homeland Security has recognized the potential of this technology and is financing research through DARPA *[Defense Advanced Research Projects Agency]* funding.

Via BMI satellite transmissions, an MMEA chip recipient can experience identical physical, emotional, and mental processes to a recipient on the other side of the world. Used for social conformity, FFF can sedate or agitate an entire community. A community covered by a wireless cloud, such as cell phone and wifi internet access require, can be unified by FFF transmissions via RF to MMEA chip implants. All that's needed is a RF transmitter and receiver tower receptive to a telecom link via satellite. Thus the manifestation of the New World Order's global consciousness on an individual basis is accomplished by FFF.

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Acoustic Field-Flow Fractionation for Particle Separation

Field-flow fractionation (FFF) is a suite of elution methods suitable for the separation and sizing of macromolecules and particles [1]. It relies on the combined effects of an applied force interacting with sample components and the parabolic velocity profile of carrier fluid in the channel. For this to be effective, the channel is unpacked and the flow must be under laminar conditions. Field or gradients that are commonly used in generating the applied force are gravity, centrifugation, fluid flow, temperature gradient, and electrical and magnetic fields. Each field or gradient produces a different subtechnique of FFF, which separates samples on the basis of a particular property of the molecules or particles.

The potential for using acoustic radiation forces generated by ultrasonic waves to extend the versatility of FFF seems very promising. Although only very preliminary experiments have been performed so far, the possibility of using such a gentle force would appear to have huge potential in biology, medicine, and environmental studies.

Acoustic radiation or ultrasonic waves are currently being exploited as a noncontact particle micromanipulation technique [2]. The main drive to develop such techniques comes from the desire to manipulate biological cells and blood constituents in biotechology and fine powders in material engineering.

In a propagating wave, the acoustic force, F_{OC}, acting on a particle is a function of size given by [1] $F_{OC} = \pi r^2 E Y_p$ (1) where r is the particle radius, E is the sound energy density, and Y_P is a complicated function depending on the characteristics of the particle which approaches unity if the wavelength used is much smaller than the particle. Particles in a solution subjected to a propagating sound wave will be pushed in the direction of sound propagation. Therefore, sized-based separations may be possible if this force is applied to generate selective transport of different components in a mixture. In a FFF channel, it is likely that the receiving wall will reflect at least some of the emitted wave. If the channel thickness corresponds exactly to one-half wavelength, then a single standing wave will be created (see Fig.1). For a single standing wave, it is interesting to note that three pressure (force) nodes are generated, one at each wall and one in the center of the channel.

Yasuda and Kamakura [3] and Mandralis and co-workers [4] have demonstrated that it is possible to generate standing-wave fields between a transducer and a reflecting wall, although of much larger dimensions (1-20 cm) than across a FFF channel. Sound travels at a velocity of 1500 m/s through water, which translates to a wave of frequency of approximately 6 MHz for a 120-μm thick FFF channel.

The force experienced by a particle in a stationary acoustic wave was reported by Yosioka and Kawasima [5] to be $F_{OC} = 4\pi r^3 k E_{OC} A \sin(2kx)$. (2) where r is the particle radius,
k is the wave number, E_{OC} is the time-averaged acoustic energy density, and A is the acoustic contrast factor given by

$$A = \frac{1}{3}\left(\frac{5P_p - P_l}{P_l + 2P_p}\right) - \frac{Y_p}{Y_l}$$ (3) where P_p and Y_p are the particle density and compressibility, respectively, and P_l and Y_l are the liquid density and compressibility, respectively.

Thus, in a propagating wave, the force on a particle has a second-order dependence, and in a standing wave, the force is third order. This should give rise to increased selectivity for separations being carried out in a stand wave [6].

Due to the nature of the acoustic fields, the distribution of the particles will depend on the particle size and the compressibility and density of the particle relative to the fluid medium. Closer examination of the acoustic contrast factor shows that 'is' may be negative (usually applicable to biological cells which are more compressible and less dense relative to

the surrounding medium) or positive (as is in many inorganic and polymer colloids). Therefore, acoustic FFF (AcFFF) has tremendous potential in very clean separations of cells from other particles. One important application may be for the separation of bacterial and algal cells in soils and sediments.

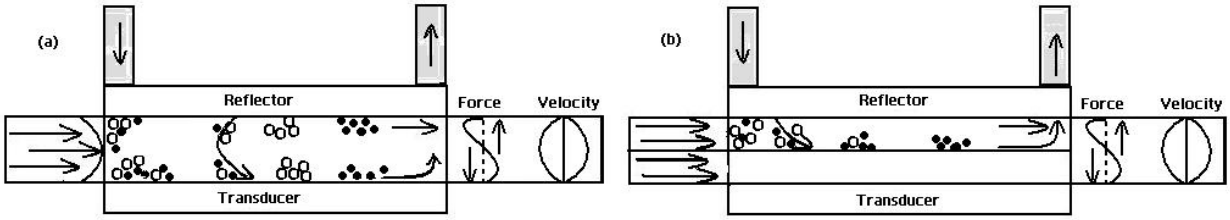

Fig. 1 Acoustic FFF channels suitable for particles with (a) $A < 0$ and (b) $A > 0$, utilizing a divided acoustic FFF channel.

If the acoustic contrast factor $A < 0$, then a conventional FFF channel will enable normal and steric mode FFF separations to be carried out (Fig. 1a).

However, if $A > 0$, then the particles will migrate toward the center of the channel. In this case, a divided FFF cell could be used as shown in Fig. 1b. This ensures that particles are driven to an accumulation wall rather than the center of the channel where the velocity profile is quite flat and selectivity would be minimal.

Johnson and Feke [7] effectively demonstrated that latex spheres migrate to the nodes (center of the cell) and Hawkes and co-workers [8] showed that yeast cells migrate to the antinodes (walls of the cell). These authors used a method similar to SPLITT, which is another technique closely related to FFF, also originallly developed by Giddings [9]. Semyonov and Maslow [10] demonstrated that acoustic fields in a FFF channel affected the retention time of a sphere of 3.8μm diameter when subjected to varying acoustic fields. However, the high resolution inherent in FFF has not yet been exploited.

Naturally, with some design modifications to the FFF channel, SPLITT cells could be used for sample concentration or fluid clarification.

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